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REMARKS BEFORE THE
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Thank you for your kind introduction. And thank you for being here today.

It is an incredible time to be at NASA!

Just last Sunday, our multi-national crew successfully completed a four million mile mission to supply the International Space Station. During the mission, the world watched in wonder and amazement as the crew completed its duties.

They made it look so easy, but it was only “easy” because we had a very clearly defined highway designed to lead us to mission success. Today, I’d like to present you with the beginnings of a similar highway for enhancing the success of aviation in America, as well as discussing your role as trailblazers along the way.

I am excited to be with you, because we share a commitment to a thriving air transportation industry. At NASA, our commitment runs deep, because you can't spell NASA without Aeronautics.

That was one of my first messages when I became NASA Administrator 7 years ago and I am very committed to it. Instead of talking to you about the programs we have in place and the goals we intend to achieve, I would like to take you for a ride on a new highway in the sky. On this imaginary ride, you will get a mental picture what the future of the aviation industry may look like – it is plan set in

place today with tools developed by NASA, jointly tested with the FAA and ultimately made a reality by FAA implementation. This is the mantra of this speech . . . and NASA has committed a 100 million dollars a year over the next five to make the skies safer.

Bear in mind that NASA is primarily concerned with safety and technological improvement . . . unfortunately we can't promise the in-flight food or movies will be any better.

The year is 2020 . . . a husband and wife and their two children board a commercial airline at Chicago O'Hare – and it is indisputably the world's busiest airport.

It's cold and foggy that evening. But they're not worried about delays. The pilot will be able to see through the fog because of high-definition synthetic vision.

Of course, this capability has also been available in General Aviation cockpits for years.

They push away from the gate; it will only be moments until they reach the runway for take-off because they are using advanced taxiway navigation tools developed by NASA and the FAA. The pilot is cleared to the runway by a computer that efficiently manages planes on the ground and in the air.

Their desitination: San Francisco. Unlike the old days in 1999, the pilot's route is nearly a straight line because of the intelligent air traffic control system developed by NASA and the FAA. The system provides excellent separation of aircraft, provides the pilots with real-time data and avoids constant re-vectoring of its path – it saves fuel, it save time and most importantly it save lives.

The pilot's cockpit displays will fuse information from many different sensors to give the pilot a complete visual picture – one-stop shopping for all flight data. Data from infrared, radar, TV, LIDAR and even a technology similar to night vision goggles will be integrated. Whether in a deep downpour, pitch black, or thick fog . . . the pilot will always see a sunny day and have total situation awareness. The pilot will even clearly see small objects like high-tension wires. And using technology developed in 1999 by NASA, pilots will be able to avoid clear air turbulence. The on-board computer will detect unusual patterns of tiny dust particles at least 35 miles ahead and give the pilot the distance, size and severity of the upcoming turbulence. So this flight, unlike those in 1999, is perfectly smooth and many times safer.

As it flies over the Rockies the jet is keeping the pristine air pristine. Compared to 1999, it has much lower carbon dioxide and nitrous oxide emissions. It is also much quieter outside the plane and inside the plane for passenger comfort. While engine noise has been reduced, actuators, which are like heavy duty speakers, are placed between the airframe and the interior walls to cancel out the residual engine noise heard in the cabin. Yes, it really works! NASA has also helped redesign airframes to relocate pressure wave patterns and further reduce noise around the passengers.

And because the FAA and NASA teamed together at the turn of the millennium and improved the certification process, this jet flies the latest composite materials. This allows the plane to operate at a much lower cost, much more efficiently and much safer.

In San Francisco, they get off the plane . . . and follow the signs to Avis and Hertz.

That's where they pick up the keys to their rental plane.

The rental plane is also surprisingly inexpensive.

As a matter of fact, thanks to the advances we spoke about earlier, the price of all airplanes has come down dramatically. Even the 4-seat personal jet they are flying cost about the same as a high-end luxury automobile.

Both the husband and wife can fly . . . because years ago, their employers saw the advantage of personal air transportation to business . . . and were confident that the infrastructure would support it.

Their oldest child . . . is 15. He'll learn to fly next year at school.

The family boards their rental plane . . . comforted by the fact that the days when General Aviation airplanes were a factor of 10 less safe than scheduled airplanes have long passed. And because of the heads up displays and its coordination with the intelligent air traffic control they are flying a “highway in the sky.” In 2020, controlled flight into terrain is no longer the number one cause of accidents.

In fact, both long haul jet transport and general aviation have surpassed the safety level that long-haul jet transports had back in 1999.

The rental aircraft is equipped with intelligent avionics. . . and our pilots cannot even fathom that there was a time when people didn't have real-time, on-board assessment of aircraft health, atmospheric conditions, and air traffic. They pity their predecessor who had to pore through 18 pages of nearly unintelligible computer printouts that were provided an hour before takeoff.

They fly to a remote area in the Pacific Northwest. That's where the grandparents have retired.

There was once a time when this area was not accessible for approaches. But now, General Aviation airplanes curve through the valley and land there all the time. Computers on all aircraft have digital maps in their databases of the local terrain, with updates broadcast continually from a commercial Litestar spacecraft constellation.

They drop the kids off and depart back for San Francisco in their rented small aircraft. There, they split up for their respective business meetings.

He boards another commercial airliner that takes him to Singapore. It's only a two-hour flight and costs no more than today's subsonic ticket prices. In 1999 aboard an experimental NASA F-15 fighter, the groundwork was established for this jet's neural networks. As it flies over the Pacific, through adaptive learning, the jet can rapidly react to catastrophic failures of critical flight control components, such as partial loss of a wing or damage to control surfaces or hydraulics. And no longer is the cockpit bound for a generation by custom built technology that quickly becomes antiquated. The FAA rapidly certifies new technology and ensures that all jets have the latest off-the-shelf technology.

Even this jet is environmentally friendly, because we solved NOx problem a long, long time ago.

She stays in the rental plane . . . because she wants to visit three separate clients . . . all in California . . . but each about 200 miles apart.

By car . . . the three sites would require a total of 12 road hours to conduct 2 hours of business at each location.

The total travel period could be up to 4 days. She would be away from her family for three nights.

But because of the advances in General Aviation I'm talking about today, she completes the business trip to these three locations in one extended business day. In 1999, a company took 80 orders for the vertical takeoff and land aircraft two years before the FAA had even certified them. In 2020, these aircraft help ease the traffic in the hub and spoke system and better yet, they help millions of travelers avoid airports entirely. Now they can land at verti-ports.

She picks up her kids and heads home the next morning.

Her husband will meet them back in Chicago . . . home of the World Champion Cubs.

Some will say this is impossible, especially the Cubs part. They say we don't have what it takes. Critics will say that this is a vision only for those who refuse to look at the real world.

At NASA and DOT, we couldn't disagree more.

We exist to discover what is possible. That is what America is about.

36 years ago, when John Glenn made his first flight into space, there were those who said we'd never get to orbit, much less to the Moon.

Almost 100 years ago now . . . when the Wright brothers were preparing for their flight . . . there were those -- reportedly, even their own father…who said we would never fly.

But we got to orbit and the Moon. And that GA plane in Kitty Hawk . . . made it into the air for 57 seconds.

Both changed the world forever.

When our future aviation system resembles the scenario I presented, we will need to go to a free flight system. That will mean a major revolution for long haul jet transport and general aviation.

And make no mistake, a revolution is what is needed. With the advent of the hub-and-spoke system, and increasing congestion, the average doorstep to destination speed is 50-60 mph for **air** trips of less than about 300-400 miles.

Think about it.

You are flying through the air at 300 to 500 mph during the part of your trip that is in the commercial airplane.

But your average speed from when you left your home to when you arrive at your destination is only 50 or 60 mph!

If the number of airline passengers doubles over the next 20 years as expected, our current hub-and-spoke aviation system will face hub-lock. Same day flight will be a thing of the past. Instead, we may have to put our names on waiting lists, like at today's restaurants. Maybe we'll even get to wear beepers to be notified when our seats became available.

Don't laugh -- one airline has predicted it could happen as early as 2012.

And even if we maintain current safety levels, the predicted growth of air traffic will lead us to over one accident a week by 2004. Accident rates might actually remain the same, but the perception would be that flying has become increasingly unsafe. We've worried about this.

We want to reduce the aircraft accident rate by a factor of five within ten years, and by a factor of ten within 20 years.

In support of the President's initiative on Aviation Safety and Security, NASA and the FAA have formed a partnership to accomplish The Aviation Safety Program.

NASA stepped up to this national priority and has committed to reprogram $500 million of the aviation enterprise's budget over 5 years.

Working with the FAA, we also set our goals in a very different way. We included partners and customers from "day one," and together, we defined the initial investment strategy, focusing on the highest pay-off areas for aviation safety: prevention, system development and monitoring, and accident mitigation.

With the aviation revolution we hope to achieve, sparked by the technologies I told you about, we may see a day when free flight is commonplace. Free flight will improve air travel affordability by increasing flight dependability and reducing delays, even at the busiest airports. Do you realize that if new technologies could shave just four minutes off every commercial flight today, it would provide additional capacity equivalent to another major airline? For an airline’s bottom line, it would mean reduced fuel costs and millions of dollars in savings.

And just imagine what a full-scale revolution in General Aviation would do. We might move toward inexpensive fleets of business jets, and when they are retired from executive service, they may be to sold fractional partnerships. Then later “recycled” into fleets of air taxis and jet pooling. The possibilities are endless!

At its peak in 1978, the U.S. general aviation industry delivered 17,811 aircraft. In 1996, the number of aircraft delivered had fallen to 1,132. But the explosive potential for new plane construction in the vision I am presenting is staggering. It

could easily revitalize America's aviation sector and take General Aviation far beyond its current revenue level of $15 billion a year.

GA is already leading the way in the entire aviation sector. Many of the most advanced technologies started in General Aviation and are now making their way into the commercial sector and, perhaps, eventually into the space program as well.

In addition to GA, space will be an area of incredible opportunity in the 21st century. I am leaving here to go to Paris as the President's Representative at the Paris Air Show. This show increasingly reflects the convergence of air and space transportation that will grow exponentially in the new millennium. In fact, I believe that there will be very little difference in the two within the next few decades — that the technologies necessary for success in both areas will be much the same.

The world is now preparing for the era of the International Space Station, and NASA has had a primary role in developing the highway to get us there. By the time the Station is fully assembled and operational, we need to already be at work on the next phase of the highway — the push into deep space and toward our dream of planting an American flag on the dusty red surface of Mars.

And as we increase access to space, you will be on the cutting edge of the journey, establishing the legal framework and infrastructure necessary for proper utilization of space. Right now, air and space law are separate disciplines. Air law is well-developed and widely practiced. Space law is fundamentally different and in its infancy. But the dynamic growth in this area may rival the burgeoning of maritime law over the past two hundred years. The biggest challenge may be in merging the two into a seamless whole.

So whether you are involved in tort, contracts, manufacturing, regulatory oversight, or any other aspect of air and space law, a revolution in aviation combined with what we are doing in space means a revolution in your way of doing things.

Opportunities abound for those who will take the risks . . . and when we work together, we can amortize the risks and compound the rewards.

We know that at NASA. That's why we are working closely with our government partners at the FAA, DOD, and DOT to help usher in the new age of aviation in the air and in space.

We're counting on you to work with us and your clients in industry, academia, and the government to fill in the details of the highway that will lead us into the new millennium.

Thank you.